

# Surface Coatings in Egyptian Art Characterized Through Spectroscopy

For objects dating back dozens of centuries, very few records of their construction and composition remain. Yet it is extremely important to have accurate information regarding the surface chemistry of art objects when preservation or restorative techniques are applied. Furthermore, it is essential that the object not be substantially consumed during characterization. To this end, the Cleveland Museum of Art has partnered with the microspectroscopy laboratory at the NASA Glenn Research Center at Lewis Field to characterize the surface coating of their prized Egyptian antiquities.

Microsamples from the relief of the *Nome Gods Bearing Offerings*, coffin lids, the bust of *Amenhotep III Wearing the Blue Crown*, and other art objects were characterized by Fourier Transform Infrared Spectroscopy (FT-IR) to determine the composition and, if possible, identify deterioration products associated with centuries of aging. The characterization is complex because the artisans selectively applied multiple varnishes in various locations of a given object. The different surface coatings appear to have been chosen on the basis of aesthetics, such as color and gloss, rather than protection. The process of identifying the original surface composition is further complicated by the treatments used by early restorers, such as impregnation of painted materials with beeswax or paraffin, materials also used by the original artisans.

FT-IR clearly distinguishes wax from plant resin materials, but it is not possible at this time to determine if the wax is from an original application or a restorative measure. There are many applications of various plant resins in the construction of art objects. In the case of the bust of Amenhotep III, several sections of carved stone were glued together. The nose sustained damage and was restored with putty. The bust was finished by the application of various colored pigments and varnish. Plant resin applications include putty for restoration or disguising artisan flaws, binder for the various pigments of paint, and varnish to hold the paint in place or provide a glossy appearance. It is difficult to identify the exact plant providing various resins; however, in many cases it is possible with the use of FT-IR, in combination with optical microscopy and fluorescence to differentiate between different resins applied to an object. Finally, animal materials such as hides were used to formulate glues and other liquids that were used in art objects. Animal materials are distinguishable from waxes and resins, but, at this time, we have not identified any in the Egyptian art works that we are examining.

The spectra obtained from coatings on the Nome gods relief, a Nefertiti portrait, and three dummy jars are virtually identical, suggesting that the coatings were of similar material. The quality of the spectra obtained from the bust of Amenhotep are distorted because of contamination or age degradation, but several key peaks in the spectra indicate that this coating is a varnish similar to that on other objects. Aside from the academic value of accurately identifying the methods of construction, this information is crucial when attempts are made to reconstruct the original appearance of an object with poorly

preserved decorative layers.

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